

CBCS SCHEME

15EE53

Fifth Semester B.E. Degree Examination, June/July 2019 Power Electronics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With neat circuit diagram and input, output waveforms explain the different types of power electronic converter circuits. (08 Marks)
- b. With the help of neat block diagram explain briefly peripheral effects associated with power converters. (08 Marks)

OR

- 2 a. What is power electronics? Mention the applications of power electronics. (06 Marks)
- b. With neat circuit diagram and associated waveforms explain the working of FWR with R load, center tapping, also derive the expressions for i) $V_{0(rms)}$ and $V_{0(avg)}$ ii) Efficiency iii) Ripple factor and iv) TUF. (10 Marks)

Module-2

- 3 a. With the help of switching model and switching waveforms explain the switching characteristics of power MOSFET. (08 Marks)
- b. For the transistor switch shown in Fig.Q.3(b). Calculate: i) The value of R_B that results in saturation with an ODF of 20 ii) The forced β and iii) Power loss in the transistor. (08 Marks)

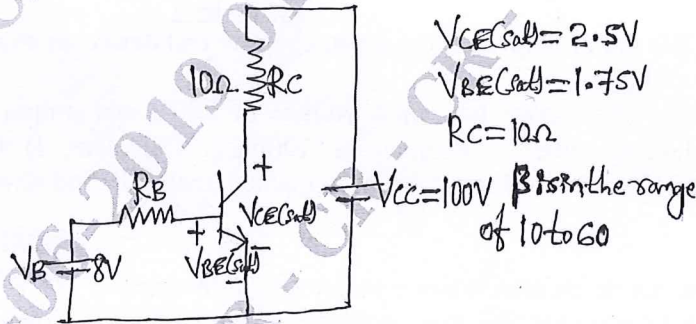


Fig.Q.3(b)

OR

- 4 a. Explain briefly isolation of gate drive using i) Pulse transformer and ii) Opto couplers. (08 Marks)
- b. The collector clamping circuit has $V_{CC} = 100V$, $R_C = 1.5\Omega$, $V_{d1} = 2.1V$, $V_{d2} = 0.9V$, $V_{BE} = 0.7V$, $V_B = 15V$, $R_B = 2.5\Omega$ and $\beta = 16$. Calculate : i) Collector current without clamping ii) Collector-emitter clamping voltage and iii) Collector current with clamping. (08 Marks)

Module-3

- 5 a. Explain the operation of thyristor with the help of two transistor model, also derive expression for anode current. (10 Marks)
- b. A thyristor operating at 220V is gated with a pulse width of 40 μ sec, the latching current of thyristor is 36 mA, for a load of 60 Ω and 2H will the thyristor gets triggered? If not find the width of the pulse for successful triggering of SCR (thyristor operating at 220V). (06 Marks)

OR

- 6 a. With current and voltage waveforms explain briefly dynamic turn on and turn off characteristics of SCR. (10 Marks)
- b. With neat circuit diagram and waveforms explain the operation of WT triggering circuit. (06 Marks)

Module-4

- 7 a. With neat circuit diagram and associated waveforms, explain the operation of single phase half wave controlled rectifier with freewheeling diode across the RL load. (08 Marks)
- b. With circuit diagram and waveforms explain briefly working of 1 ϕ dual converter. (08 Marks)

OR

- 8 a. With neat circuit diagram and waveforms, explain the operation of half wave AC voltage controller with resistive load. (06 Marks)
- b. A 1 ϕ half wave ACVC has a resistive load of $R = 5\Omega$ and input voltage $V_s = 120V$, 60Hz if delay angle $\alpha = \frac{\pi}{3}$. Calculate: i) RMS output voltage, ii) Input Power Factor and iii) Average output current. (06 Marks)
- c. Briefly explain the applications of AC voltage controllers. (04 Marks)

Module-5

- 9 a. Explain the principle of step-down chopper and derive an expression for average and output rms voltage. (08 Marks)
- b. A step up chopper has input voltage of 220V and output voltage of 660V. If the non conducting time of chopper is 100 μ sec. Calculate: i) Conducting time of chopper ii) If TON is halved for constant frequency operation find new output voltage. (08 Marks)

OR

- 10 a. Write a note on performance parameters of inverter. (06 Marks)
- b. With neat circuit diagram and waveforms explain the operation of transistorized current source inverter. (10 Marks)
